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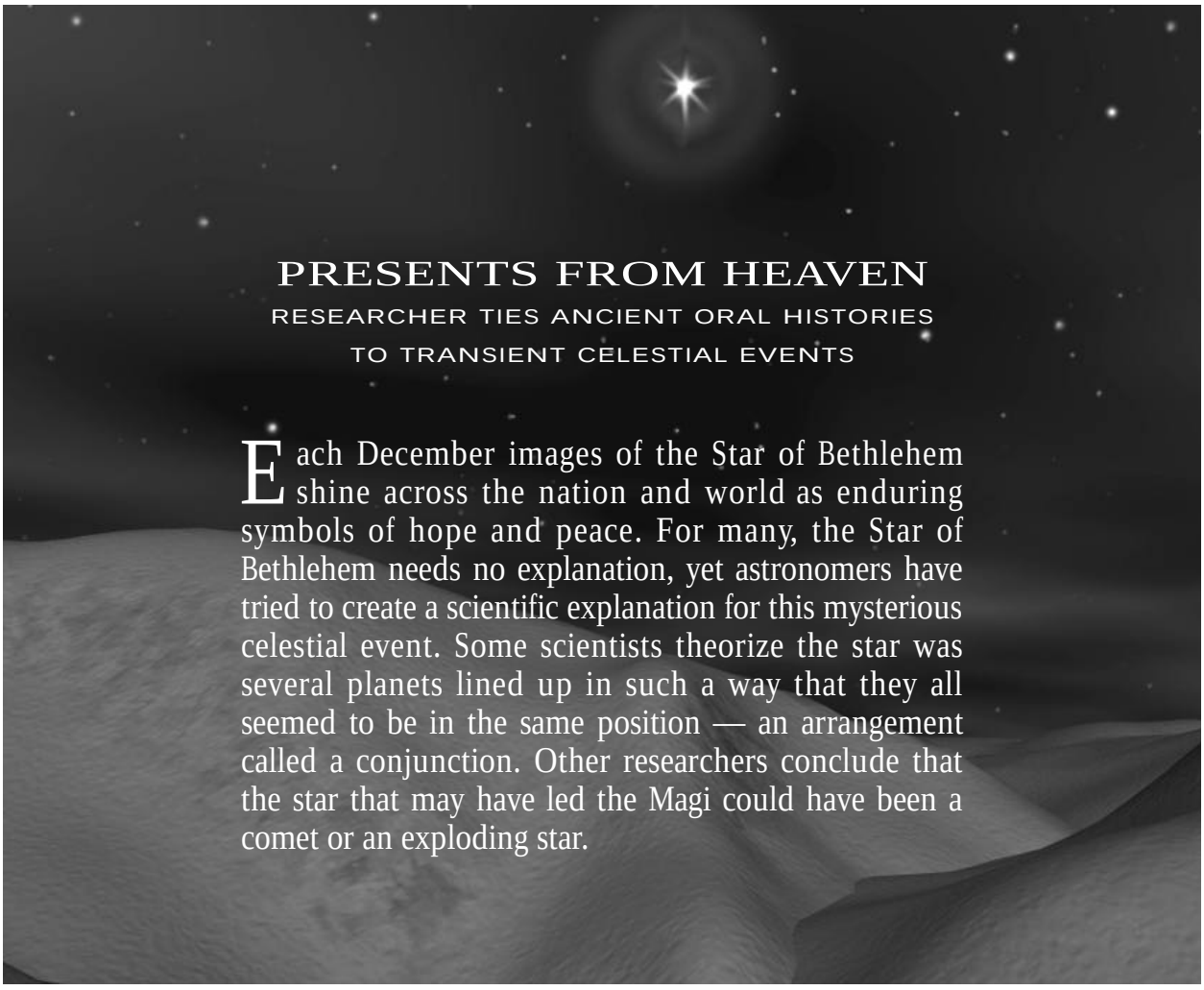
WHERE SCIENCE MAKES A DIFFERENCE

DATELINE
LOS ALAMOS

U.S. DEPARTMENT OF ENERGY
UNIVERSITY OF CALIFORNIA



PRESENTS FROM HEAVEN

RESEARCHER TIES ANCIENT ORAL HISTORIES TO TRANSIENT CELESTIAL EVENTS

Each December images of the Star of Bethlehem shine across the nation and world as enduring symbols of hope and peace. For many, the Star of Bethlehem needs no explanation, yet astronomers have tried to create a scientific explanation for this mysterious celestial event. Some scientists theorize the star was several planets lined up in such a way that they all seemed to be in the same position — an arrangement called a conjunction. Other researchers conclude that the star that may have led the Magi could have been a comet or an exploding star.

The exploding star, or supernova theory, is a potent choice since history tells us that in 1054 A.D. the M1 supernova that produced the present day Crab Nebula was so bright, it could easily be seen during the day.

Two even brighter supernovae occurred earlier, in 185 A.D. and 1006 A.D., were much more spectacular than the Crab Nebula. A few more near-Earth novae were, briefly, even brighter, being compared in magnitude with the full moon.

Whatever the cause, the star may be an example of what scientists call cosmic transients.

These short-duration, one-time astrophysical events last anywhere from less than a second to as long as a few years and have been impacting civilizations longer than was previously believed, according to a Los Alamos researcher.

DATELINE LOS ALAMOS

A MONTHLY PUBLICATION OF THE PUBLIC AFFAIRS OFFICE OF LOS ALAMOS NATIONAL LABORATORY

LOS ALAMOS NATIONAL LABORATORY, AN AFFIRMATIVE ACTION / EQUAL OPPORTUNITY EMPLOYER, IS OPERATED BY THE UNIVERSITY OF CALIFORNIA FOR THE U.S. DEPARTMENT OF ENERGY UNDER CONTRACT NO. W-7405-ENG-36

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Archeologist Bruce Masse's research has linked transient celestial events to ancient beliefs and customs. Because images such as the ones on Page 5 may still hold deep religious significance for people today, says Masse, they should be viewed by the reader with the same deference and respect given other important religious and cultural symbols such as the Star of Bethlehem.

The general consensus was that early societies used the fixed celestial heavens in their art, myths, religions and politics to regulate rituals and agricultural cycles. The cyclic world of regular celestial events likely also fulfilled a psychological need by ancient civilizations to link themselves with the surrounding universe.

But conventional researchers have overlooked linking the transient celestial events to ancient beliefs and customs, according to Los Alamos archeologist Bruce Masse. Indeed, astronomers have even expressed doubts about the ability of most past cultures to recognize or at least categorize such events.

Like most archeologists, Masse was taught to avoid astronomy, mythology and oral histories. He had been taught that myths were largely psychological and that oral history that was told for more than six or seven generations could not be trusted because of too many distortions.

Masse now believes that ancient cosmogonic myths and many oral histories provide an accurate representation of ancient celestial events.

Masse has compiled a historical database of 1,200 naked-eye visible transient events including novae, comets, meteor showers and storms, cosmic impacts as well as lunar and solar eclipses. The database can be used with written and oral histories and demonstrates direct comparison and relationships with these records and detailed archeological records of many past civilizations.

The evidence from Hawaii and the American Southwest indicates that transient celestial events were not only recognized and categorized, but formed a critical component of mythology, cosmology, politics, religion and early science.

The term comet is from the Greek word kometes, "long-haired." When missionary William Ellis first visited the Hawaiian Islands in 1823, he recorded this information about the important god Ku (from "Journal of William Ellis," 1979, Tuttle, Rutland, Vt.): "The natives were very desirous to shew us the place where the image of [Ku] the war-god stood, and told us that frequently in the evening he used to be seen flying about in the neighbourhood, in the form of a luminous substance like a flame, or like the tail of a comet." The image on the left is one of the few surviving wooden images believed to be that of Ku. The hair style and facial expression of this image is remarkably similar to the coma of a comet, such as that on the right drawn in 1858 of Comet Donati by George P. Bond of Harvard College Observatory. It is likely that the Ku image represents the passage of a 17th-18th century near-Earth comet. (Ku image from "Bishop Museum and the Changing World of Hawaii," Nelson Foster, 1993, Bishop Museum Press, Honolulu. Reprinted by permission of Bishop Museum Press.)

These images found on pottery and rock art likely represent solar eclipse phenomena witnessed by Pueblo Indians in the Four Corners area of the Southwest during the 14th century. The images above are "star demons" — normal stars and constellations transformed into malevolent spirits by the eclipse. The images at right are of the solar eclipses themselves.

Based primarily on research that Masse did in the Hawaiian Islands, he asserts that ancient cultural traditions can be scrutinized and fitted into a chronology of temporary celestial events.

Hawaiians have a rich oral history, closely tied to royal genealogies extending back more than 95 generations. These accounts describe 2,000 years of chiefly power. These fundamentals of Hawaiian life and religion Masse now directly ties to transient celestial events.

For example, a story about the coming of the volcano goddess Pele to Hawaii now can be correlated with a series of spectacular great meteor showers and other celestial events between 900 and 934 A.D.

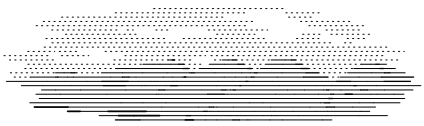
These events include: a bright nova in the constellation Hercules; the first ever great Leonid meteor shower in 900 and the second Leonid meteor shower in 902; a spectacular comet in 905 that changed abruptly from blood red to silky white; another nova event in Hercules in 911; an appearance of Halley's comet in 912; and a unique series of eight spectacular great meteor showers in 10 years between 924 and 934. Pele was then transformed from a sky goddess to a goddess of Hawaiian volcanoes.

A more recent legendary battle is told between Pele and a half-man, half-hog demigod named Kamapua'a, translated meaning the sparkling bundle of eyes. This story is an accurate description, or encoding, of the coincidence of the 1301 appearance of Halley's Comet with the largest rift eruption in Kilauea volcano history.

Masse has applied this theory to the ancient civilizations like the Aztec, Maya and even the Anasazi. Masse has found many similarities between the Hawaiian ancient culture and those that lived on the American continents.

Similarities include the practice of naming the chief and royalty after spectacular transient events. Another similarity is that the myths of gods who battle each other are representations of temporary celestial events.

An example is the Aztec myth about the creation of the fifth sun. The fifth sun is a story that describes an event that occurs after a worldwide catastrophe had destroyed the fourth sun and how two



gods sacrificed themselves to create the modern sun and moon. The imagery contained in the myth may encode a total, late afternoon solar eclipse that happened in 750 A.D., leading to the destruction of Teotihuacan, the largest city in the Americas at that time.

Masse asserts that the construction of the famous Feathered Serpent temple complex at Teotihuacan may be attributed to celestial events that also were recorded in legends about the initial colonization of Hawaii; the remarkable red-tailed comet in 178 A.D. followed by a spectacular supernova in 185 A.D., as well as local solar eclipses.

Masse began studying more ancient myths and found that most of the myths he looked at were filled with celestial imagery. Realizing that the Hawaiian myths encoded real environmental events, Masse assumed the other myths did too.

Masse's melding of ancient myth with the cosmos is certain to invoke criticism and debate. Unfortunately, Masse's work is not helped by some authors who have claimed that ancient myths represented alien visitors. He is open to hearty discussion with fellow researchers who may not have recognized cosmic data and the implications the data may have on myth and folklore.

In fact, in reviewing ancient myths, Masse discovered that every civilization has a great flood myth. Masse's latest research is diving into these stories to see if the truth in the myth may actually be a collision by a comet that crashed into the ocean wreaking havoc in the form of rain and floods.

Masse says that the study of these ancient stories can help demystify history. In ancient civilizations, science and religion had the same basis and the information was written down in religious texts or told by trained storytellers.

Even if Masse's theory is only partially correct, he hopes the discussion will break down communication barriers between science and religion and various disciplines.

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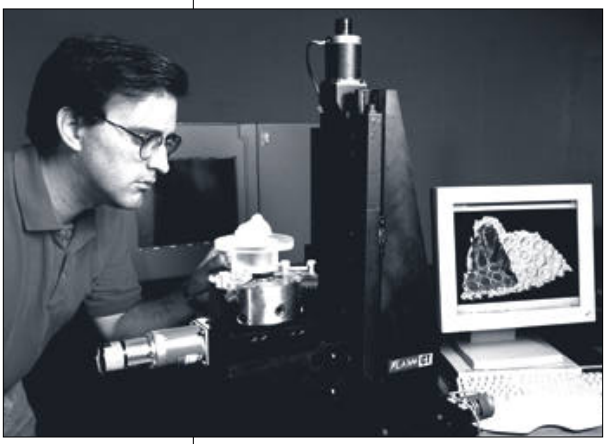
DATELINE: LOS ALAMOS

THREE-DIMENSIONAL IMAGING

NEW TECHNOLOGY HAS DEFENSE AND INDUSTRIAL APPLICATIONS

A technology used to help scientists evaluate the nation's nuclear stockpile by using three-dimensional imaging also has industrial applications.

Researchers in Los Alamos' Measurement Technology Group have developed the Flash 3-D computed tomography system, which can be used for structural evaluations, nuclear waste inspection, inspection and verification of component assemblies, nondestructive materials evaluation, detection of material defects, rapid flaw detection in oil field pipes before insertion and other applications.



Charles Hills demonstrates the Flash 3-D computed tomography system with a piece of coral. The reconstructed image of the coral is on the data acquisition computer display. The cover of the detector has been removed to reveal the amorphous silicon detector array.

Outside the weapons arena, the system can be used in the airline, automobile and prosthetics industries, and in ceramics manufacturing.

Flash three-dimensional computed tomography primarily supports Los Alamos' mission of stockpile stewardship by providing scientists three-dimensional, near real-time data on weapons parts, assemblies and components.

The Los Alamos system takes an "image" of the interior of an object by electronically detecting the variation in X-ray transmission through a section of the object at different angles.

With the Flash 3-D computed tomography system, the operator flashes an X-ray through the object being imaged; a large area (11 by 16 inches) amorphous silicon detection panel tied into a computer captures the flash. The panel contains millions of photodiodes, which collect and read the flash.

With this system, the object to be imaged is placed on a pedestal that rotates so that sections or slices of the object can be viewed. A computer collects the data and forms a three-dimensional image of the object that can be displayed on a computer monitor.

The new computed tomography system already has helped a company outside Los Alamos. Last year, a major defense contractor discovered a manufacturing problem with a large batch of its rocket motors. Researchers from the company flew out and asked the Laboratory to demonstrate the system on its motors. In less than half a day, the flash computed tomography system was able to detect misalignment of two parts, allowing the company to make corrections in its manufacturing process.

The Los Alamos-developed technology has a more dynamic range than X-ray film, resulting in greater contrast.

With today's faster, low-cost personal computers and availability of improved viewing software, three-dimensional computed tomography has become more practical.

For companies in production mode, the Los Alamos-developed system can save time and money by producing computed tomography images faster and more cheaply than conventional radiographic facilities.

The system developed at Los Alamos is portable and can be assembled and become fully operational in less than one hour, while it takes days to set up and align a conventional computed tomography system.

Los Alamos researchers say the next generation of computed tomography will include the technology to do three-dimensional computer modeling, another Los Alamos strength and a cornerstone of the Laboratory's stockpile stewardship program through the Accelerated Strategic Computing Initiative.

A Los Alamos-based design engineering firm, HYTEC Inc., has a Cooperative Research and Development Agreement with the Laboratory for Flash CT. HYTEC is collaborating with other Department of Energy sites to implement this technology.

The technology was one of 17 submitted by Los Alamos to this year's R&D 100 Award competition, sponsored by the Illinois-based *R&D Magazine*. (See the September/October 1999 issue of *Dateline: Los Alamos*.)

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DATELINE: LOS ALAMOS

CONGRESS CUTS LDRD FUNDING

LABORATORY WORKING TO ENSURE LONG-TERM SUPPORT FOR THE PROGRAM

The August issue of *Dateline: Los Alamos* explored the challenges and accomplishments of Laboratory-initiated research and development, which focuses resources — for the past decade 6 percent of the Laboratory's overall budget — on the early exploration of creative science in areas that address the Lab's core national security mission and support emerging new mission objectives of the Department of Energy.

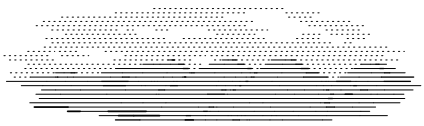
In the past 10 years, Laboratory-Directed Research and Development (LDRD) projects have accounted for 40 percent of the Lab's patents and 60 percent of its R&D 100 awards, presented yearly by Illinois-based *R&D Magazine* to the nation's top technological achievements.

Projects detailed in the special issue were in areas including weapons and the stockpile, accelerator technologies, threat reduction, bioscience and biotechnology, and environmental sciences.

The LDRD program at all three defense labs was reduced for Fiscal Year 2000 to 4 percent of the labs' overall budgets by Congress.

However, the Los Alamos program has retained projects in all of the major areas highlighted in the *Dateline* issue. And Los Alamos is working with Sandia and Livermore national laboratories and the DOE to convince decision-makers that funding should be restored to its previous level in future budgets.

"LDRD has a sustained history of producing science and technology that's valuable to the Laboratory's core mission," said new LDRD



Program Director David Watkins. “Eighty percent of the Laboratory's funding is provided by national security programs, and 90 percent of its LDRD projects have direct relevance to the needs of these programs. While the remaining projects may not initially seem to have such relevance, our experience often shows that they ultimately do.”

In FY 99, the LDRD program spent just over $71 million on more than 200 projects involving 1,652 individual employees who worked on the projects, on average, a quarter of their time.

“Most of these people are well integrated into other programmatic activities, and we certainly don't want to lose the ability to transfer the skills and knowledge they gain from LDRD projects to programmatic efforts,” Watkins said.

“It has been extremely difficult to cut $25 million of first-rate research after investing months in a careful, peer-reviewed planning process for selecting and assessing our LDRD project portfolio,” said Deputy Laboratory Director Bill Press. “The process has caused significant disruption for many of our best scientists.”

While he is optimistic that the LDRD program will be able to weather this year's funding setback, Press said he continues to believe that the 6-percent level is essential for the long-term health of the Los Alamos defense programs and the national labs generally.

“As a consequence of the 4-percent budget, we have become concerned about the long-term prospects for sustaining Los Alamos' position as a first-class scientific organization,” Press said. “It's essential that this be turned around and that we get back to where we can invest in our future through a program that has proven its value in the past.”

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LOCAL NESTING OWLS INSPIRE MOLECULAR ECOLOGY PROJECT

RESEARCHERS USE FEATHERS TO STUDY MEXICAN SPOTTED OWL GENETICS

A molting Mexican spotted owl.

A pair of Mexican spotted owls nesting in Los Alamos have inspired a unique molecular ecology project that may help preserve many other endangered species.

With technology developed through the Lab's Center for Human Genome Studies, researchers are using modern molecular biology methods to study the genetic characteristics of the spotted owl. Their work could provide valuable information about the birds' habits to wildlife researchers interested in stabilizing endangered species populations through non-invasive, in-depth analyses of their DNA.

A team with extensive experience studying bird genetics is developing a method of analyzing the DNA characteristics of spotted owls nesting in the Jemez Mountains and tracking their habits by collecting and analyzing their feathers.

Jon Longmire and Mary Maltbie of the Lab's new Bioscience Division, Leslie Hansen of the Ecology Group and contract wildlife biologist Terrell Johnson also are comparing their discoveries about the Jemez owl population with information gleaned from the feathers of birds from the Sangre de Cristo and other adjacent mountain ranges. Eventually, they hope to draw conclusions about the species' range and the genetic ties between different populations.

Longmire and Maltbie began working together on bird genetics projects as graduate students at Texas Tech University. They developed a method of DNA analysis to sex birds including California condors, emus, geese and falcons, which have no visible distinguishing sexual characteristics. Maltbie is now a postdoctoral fellow in Longmire's lab. Over the years, they have built a reputation for molecular biology studies on various species of birds including peregrine falcons and whooping cranes.

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"We decided to propose an LDRD project that might have a positive impact on a species of local importance," Longmire said.

Laboratory-Directed Research and Development (LDRD) allows the Lab to invest in innovative research to extend its science and technology capabilities. The project addresses the Laboratory's civilian national mission, while expanding its core technical competency in bioscience and biotechnology. Part of the Laboratory and the Department of Energy's joint responsibility is to provide stewardship of the environment, and the owl DNA project is an outgrowth of that responsibility. (For more information on the LDRD program, see the August 1999 issue of *Dateline: Los Alamos.*)

The Mexican spotted owl (*Strix occidentalis lucida*) was listed as federally threatened in 1993. This subspecies of the spotted owl is found in northern Arizona, southeastern Utah and southwestern Colorado south through New Mexico, west Texas and into Mexico. The Mexican spotted owl generally inhabits mixed conifer, pine-oak and riparian habitat in mountains and canyons.

The U.S. Fish and Wildlife Service's recovery plan for the subspecies requires research on population biology, gene flow and genetic isolation of populations. To gain such information in the past, researchers needed to capture and handle the birds to take blood or tissue samples. Studying the feathers the birds have molted in and around their nests eliminates concerns of hurting the owls or changing their behavior.

Johnson has collected nearly 600 Mexican spotted owl feathers from 16 identified territories in the Jemez Mountains over the past 17 years. Hansen has built a database of feathers, after photographing each one, giving it a number for tracking purposes and placing it in a bag to ensure no cross contamination occurs.

Researchers are able to obtain DNA from owl feathers, instead of from blood or tissue samples.

Maltbie works with the feathers in the lab where she isolates the DNA for analysis. She takes the end of a feather, dices it up and places it in a solution that ruptures the cells and releases the DNA. After eliminating the proteins and other contaminants, she is left with a relatively pure form of DNA that looks like water.

"We examine the sample for a specific set of repeats, usually one to six base pairs repeated over and over," Maltbie said.

Jon Longmire and Mary Maltbie examine an X-ray film from an experiment to identify clones within the library of spotted owl DNA that contain the microsatellite sequences they're searching for.

"These sets of repeats are known as microsatellites."

A library has been constructed from a DNA sample of a Mexican spotted owl housed in a rehabilitation center in Albuquerque. The library provides a way to archive a series of DNA fragments that together constitute multiple copies of the entire genome of the spotted owl.

Maltbie has isolated individual microsatellite clones from the library and is building sets of locus-specific primers to use with the polymerase chain reaction to analyze microsatellites from the feather DNA.

The process has been laborious thus far, and Maltbie has filled several notebooks with columns of data, but she expects the pace to quicken soon. "Once the primers are made and fine-tuned, the data will be produced pretty fast," she said.

The data produced by this project will allow the researchers to gain a better understanding of several aspects of spotted owl biology.

"We don't yet know how far these birds travel, how long they live, how successful they are at reproducing or whether they are site-specific," Longmire said. "When our database is complete, we will be able to identify every individual bird within the population and begin to answer some of these questions."

A comparison of DNA from different populations will be useful in making management decisions should the numbers of one group begin to decline.

"We would want to know which of the available healthy populations are genetically similar to one that's crashing so wildlife managers can make informed decisions on restocking," Longmire said. "We also may find out that there's not enough genetic variation present within a population for it to be healthy, and managers may want to introduce birds that will add genetic diversity."

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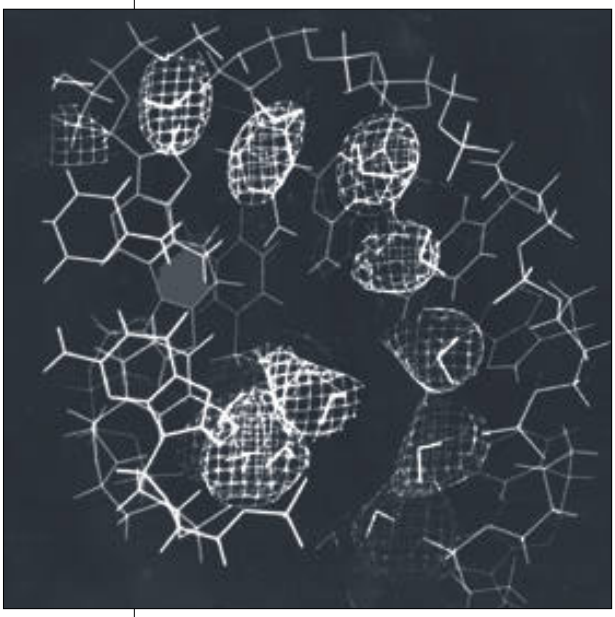
EXPERIMENTAL STATION AIMS TO OPEN IN 2001

SURVEY REVEALS HIGH DEMAND FOR STRUCTURAL BIOLOGY NEUTRON DIFFRACTION EXPERIMENTS

U.S. scientists are eager to take advantage of a planned structural biology neutron diffraction station inside Los Alamos' Manuel J. Lujan Neutron Scattering Center that will use neutrons produced by its most powerful accelerator for fundamental studies of biological structures.

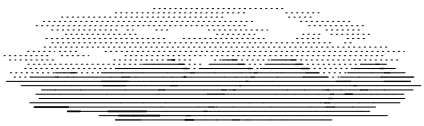
The Laboratory recently completed a survey designed to gauge the needs of the U.S. structural biology community for neutron diffraction instrumentation. The results will help in planning for the anticipated high user demand when the experimental station becomes operational in mid-2001. The station, currently under construction, will be used to study protein crystals, membranes, biological fibers and other biological structures.



A view down one of the grooves of the DNA double helix. The DNA atoms are represented by a skeletal model. The oval shapes represent ordered water, as determined from neutron diffraction studies, which stabilizes the DNA molecule in one of its biological important forms.

"This neutron diffraction station will be the only resource of its kind in the nation serving the structural biology community for determining macromolecular structures, once it's completed," said program manager Paul Langan.

With neutron diffraction, a beam of neutrons passes through a material under study and scatters into a pattern that reveals the relative positions of the atoms in the target material. Neutron diffraction's big advantage over X-ray diffraction is that neutrons can pinpoint the positions of hydrogen atoms. Hydrogen atoms are crucially important to the catalytic activity of enzymes and the macromolecular structure of proteins.



The survey went out to more than 700 researchers in the structural biology community at more than 100 universities, laboratories and private businesses nationwide.

Among major findings of the survey were:

• Seventy-seven percent of all respondents said they expect to use neutron diffraction techniques in the future. In fact, 72 percent of respondents who currently do not use neutrons stated they anticipate using neutron diffraction in the future.

• Forty percent said they plan to be major users of neutron diffraction, and 37 percent plan to use neutron diffraction occasionally.

• Forty-three percent of respondents want to be represented on a Structural Biology Diffraction User Group that will recommend which structural biology and biochemistry neutron experiments should receive priority to the overall LANSCE Program Advisory Committee.

The station will be able to serve only about one-fifth of the anticipated demand, which is why the survey results also are being sent to Oak Ridge National Laboratory, where the Department of Energy's Spallation Neutron Source is to be built.

"We hope that the anticipated high demand for neutron diffraction revealed in the survey will convince Oak Ridge to build two neutron diffraction instruments within SNS," said principal investigator Benno Schoenborn.

The DOE's Office of Biological and Environmental Research is funding the construction of Los Alamos' experimental station.

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CHALLENGING SUPERCOMPUTING

GOVERNOR RECOGNIZES HIGH SCHOOL CONTEST

New Mexico Gov. Gary Johnson recently recognized the Laboratory's High School Supercomputing Challenge for helping to expose high school students to science through use of the Lab's super computers and improving the qualify of life for all New Mexico residents.

In proclaiming October as "Supercomputing Month" in New Mexico, the governor said the challenge gives high school students the opportunity to work with peers on a statewide basis in a nonselective atmosphere. He described students' access to powerful supercomputers as "a benefit unique to New Mexico and not found anywhere else in the world."

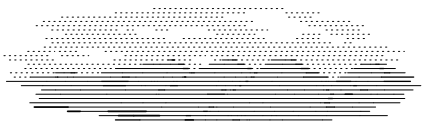
David Kratzer, coordinator of the supercomputing challenge, received a certificate of appreciation from the governor for his "outstanding service to the children, educators and citizenry of New Mexico. Your efforts in making a difference have served as an example for us all, and the citizens of the state of New Mexico owe you a debt of gratitude for your commitment and devotion," the certificate states.

↑ Members of last year's first-place Supercomputing Challenge team are interviewed by a television news reporter.

The goal of the New Mexico High School Supercomputing Challenge is to increase knowledge of science and computing, expose students and teachers to computers and applied mathematics, and instill enthusiasm for science in high school students, their families and communities. Any New Mexico high school student in grades 9-12 can enter the Supercomputing Challenge, now in its 10th year.

Unlike other computing competitions, the New Mexico High School Supercomputing Challenge is unique because it offers supercomputer access to students at every level of expertise and stresses student activity over work by teachers and coaches.

The Challenge also has allowed Los Alamos to partner with the computing industry and academia. A number of local, national and regional companies, including Intel Corp., Microsoft, SGI (formerly Silicon Graphics),



CISCO Systems, Kinko's and New Mexico Technet Inc., have acted as sponsors or supported the challenge by providing computer software and hardware and other items as prizes for the winning student teams.

Sandia National Laboratories, the Air Force Research Laboratory, New Mexico Institute of Mining and Technology, New Mexico State University, University of New Mexico, Eastern New Mexico University, the New Mexico Department of Education, New Mexico Highlands University, San Juan and Santa Fe community colleges and the Council for Higher Education Computing Services also have partnered with Los Alamos on the Supercomputing Challenge.

The Challenge also has served as a recruiting tool to attract high school students to work at the Lab. Employees who participated in the Challenge have credited it with increasing their interest in Los Alamos as a potential employer.

"I've hired several personally," said Kratzer. "One of the judges who is a group leader was impressed enough that she contacted me to contact a student to offer her a job [last] summer."

The Supercomputing Challenge was conceived in 1990 by former Los Alamos Director Sig Hecker and Tom Thornhill, president of New Mexico Technet Inc., a not-for-profit company that in 1985 set up a computer network to link New Mexico's national laboratories, universities, state government and some private companies.

Jeff Hay of Los Alamos' Network Engineering Group participated in the Challenge during the 1992-93 school year while attending the Career Enrichment Center, a computer and information technology magnet school in Albuquerque. Hay teamed with other students on a computational fluid dynamic problem involving wind tunnel modeling.

His experience in the challenge, Hay said, spurred his interest in the Lab. "I realized that the Lab does a lot of really neat computer research, and that's what I wanted to go into."

More information about the Challenge also can be found on the World Wide Web at http://www.challenge.nm.org online.

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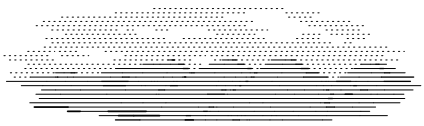
VISUALIZE THIS

VIRTUAL-REALITY THEATER LETS SCIENTISTS SEE IN DETAIL

Last summer's blockbuster movie "The Phantom Menace" dazzled audiences with its flights of special-effects fancy. Some of those special effects were created using infinite-reality graphics pipes built by SGI Inc., formerly Silicon Graphics. Here at Los Alamos, Luke Skywalker isn't chasing intergalactic bad guys. Rather, scientists are using the state-of-the-art technology to help visualize large sets of data generated from supercomputers. The Laboratory's so-called visualization theater is a physics tool for researchers involved in stockpile stewardship and management.

Scientists need better visualization techniques to analyze the large volumes of data generated by computer simulations. In the weapons arena, they want to see what happens during the implosion process and see in detail what goes on in a complex multiphysics calculation.

Researchers examine a Rayleigh-Taylor mixing simulation displayed on the viewing wall of Los Alamos' visualization theater.



The visualization theater helps scientists do just that with the help of Los Alamos' vast supercomputing capabilities.

The Los Alamos Visualization SuperCorridor is part of the Accelerated Strategic Computing Initiative, a key component of the Department of Energy's stockpile stewardship program involving Los Alamos, Sandia National Laboratories in Albuquerque and Lawrence Livermore National Laboratory in California.

The heart of the visualization theater is a system designed by Fakespace Inc., of Mountain View, Calif. A 15-foot-by-9-foot, high-resolution screen shows three-dimensional images flashed onto the screen by six rear projection screens. A control console in the theater allows scientists to remotely manipulate images on the screen to view them from different angles.

Through the infinite-reality graphics pipes scientists can read the simulation data and generate visualization data and transmit it via fiber optic cable to 18 locations throughout Los Alamos' Applied Physics Division.

In addition to the viewing wall, the Visualization SuperCorridor includes two immersive workbench virtual-reality display devices. The workbenches, also built by Fakespace Inc., provide a 6-foot-by-5-foot viewing screen to display data.

Researchers can manipulate the data by using a virtual-reality pinch glove, similar to a mouse on a computer. When wearing virtual-reality glasses, or goggles, researchers can see their manipulations of the data in three-dimensional form.

The present visualization theater is an outside-looking-in environment. A next-generation theater currently under construction will allow scientists to look at data from the inside out. Scientists could, for example, look at the individual cells in a 100-million-cell calculation and find an aberration in a single computational cell.

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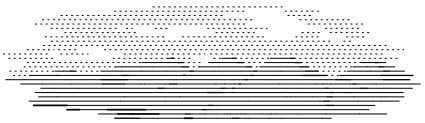

BRIEFLY ...

RAYMOND JUZAITIS HAS BEEN NAMED TO A NEW DUAL ROLE AT LOS ALAMOS. He will serve as deputy associate Laboratory director for nuclear weapons and director for the Department of Energy's Defense Programs Office National Hydrodynamic Testing Program. In both jobs, Juzaitis will oversee the development and execution of advanced hydrodynamic testing, part of the U.S. science-based stockpile stewardship program, which strives to ensure the safety and reliability of nuclear weapons without nuclear testing by using nonnuclear hydrodynamic tests, and computer modeling and simulation. Juzaitis will focus on two major areas. The first will involve the development and use of X-ray and proton technologies as advanced radiographic instruments applied to visualizing dynamic processes deep inside weapons-relevant experiments. The other will be to structure and coordinate the hydrodynamic testing program and ensure a broad national approach is taken to integrate the existing programs at each of the weapons laboratories and to establish the various Laboratory test facilities as national user facilities.

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A MONTHLY PUBLICATION OF THE PUBLIC AFFAIRS OFFICE OF LOS ALAMOS NATIONAL LABORATORY

Nonprofit Organization
U.S. Postage Paid
Albuquerque, NM
Permit No.532

LALP 99-1-12

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